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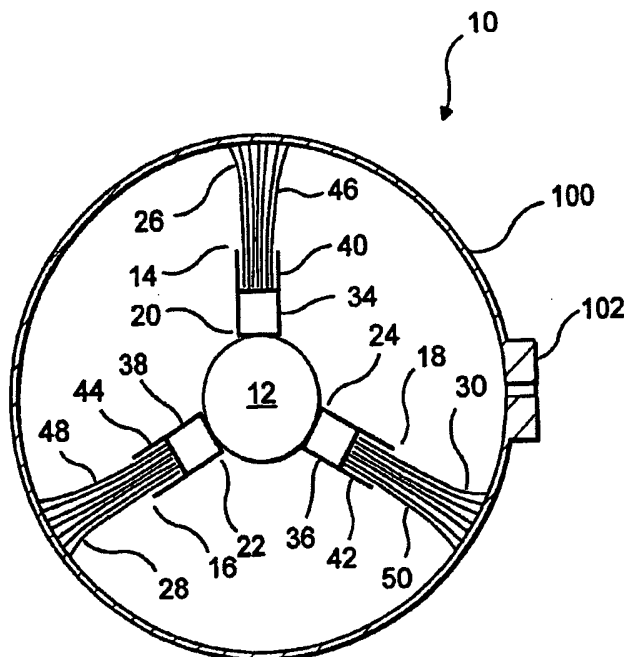
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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
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(54) Title: COMPLIANT BRUSH SHOWER



(57) Abstract: The compliant brush shower includes a central rotational rod (12) along the longitudinal axis of a shower pipe (100). The shower pipe (100) includes nozzles (102) formed in the walls thereof. Brush assemblies (14, 16, 18) extend radially from the central rotational rod (12) so that distal ends (26, 28, 30) of the brush assemblies include bristles (46, 48, 50) which extend to the inner wall of the shower pipe and further momentarily extend through the nozzles during rotation of the central rotational rod in order to clean or unplug the nozzles. Compliant elements (34, 36, 38), typically comprised of springs, are formed between the central rotational rod (12) and the bristles (46, 48, 50) so that compliance is added to the brush assemblies independent of the stiffness of the bristles of the brush.

WO 01/36743 A1

COMPLIANT BRUSH SHOWER
BACKGROUND OF THE INVENTION

Field of the Invention

This invention pertains to an internal brush for purging the nozzles of a shower used in a papermaking or similar process. More particularly, the internal brush is mounted on a compliant brush holder in order to accommodate variations in brush height and pipe diameter.

Description of the Prior Art

In the papermaking process, it is necessary to use a shower to apply water or other fluids to endless belts along the papermaking machine. These showers are typically either high pressure, relatively low volume needle showers or low pressure, high volume fan showers. High pressure fluid relies on the kinetic energy in a concentrated stream to dislodge contaminants in the fabric thereby opening the fabric. In contrast, high volume low pressure fluid is used to flush contaminants from fabrics. High volume fluid is typically applied in a dispersed stream to achieve a relatively uniform application. Nozzle diameters for these showers typically range from 0.28 to 0.125 inches but can, in the extreme, range from 0.01 to 0.75 inches. Depending upon the specific application, these showers may run continuously or intermittently.

It is imperative that these showers do not become plugged during use. The tendency for showers to become plugged has generally increased with the

increased use of recycled water in the papermaking process due to environmental and efficiency concerns.

Self-purging nozzles are known in the prior art. These nozzles may typically include a brush shower which is an externally actuated internal brush that brushes the nozzles from the inside. Usually the brushes are mounted on a shaft coaxially with the shower pipe, so that the rows are brushes are parallel with the shower axis. The shaft is turned, causing the brushes to sweep across the row of nozzles. The whole length of the pipe or just the nozzles can be brushed, depending on the brush configuration. The brushes are usually crimped stainless steel wire but, alternatively, can be polymer bristles.

As an alternative to rotation, the brushes can be mounted along a circumference of the shaft and oscillated longitudinally or axially in order to achieve the same effect.

The brushes must be tough enough to dislodge accumulated fibers, minerals, and other contaminants from the nozzles and pipe. Therefore, the brushes must be stiff to be effective. However, the brushes must be compliant enough to reach into the nozzles and clean the orifices, and accommodate variations in pipe diameters from manufacturing tolerances. Therefore, the need for stiffness can conflict with the need for compliance. In other words, variations in pipe diameter, pipe straightness, shaft diameter, shaft straightness, brush diameter and other factors make the position of the brush with respect to the pipe

and nozzle inherently variable. However, because the brushes are stiff, small variations, as little as 1/32 of an inch can make the difference between effective operation and brushes that either don't
5 touch the pipe or are too tight to turn.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a shower brush which can clean or purge the nozzles of a high pressure shower or a low pressure
10 shower, for papermaking or similar application.

It is therefore a further object of this invention to provide a shower brush with bristles which are sufficiently stiff to perform the cleaning or purging of the nozzles effectively.

15 It is therefore a still further object of this invention to provide a shower brush which has sufficient compliance to conform to variations in the structure of the shower or the brush, or to variations in related structures.

20 These and other objects are attained by providing an internal brush with an array of stiff bristles which rotates within a shower to clean the radially extending nozzles. The bristles of the brush are mounted on compliant brush holders formed
25 of a leaf spring, a wave spring, a series of such springs, similar springs, or a foam rubber support in order to add compliance to the brush while maintaining the stiffness of the bristles.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Further objects and advantages of the invention will become apparent from the following

description and claims, and from the accompanying drawings, wherein:

Figure 1 is a cross-sectional view of the compliant brush shower of the present invention.

5 Figure 2 is a plan view of the compliant brush holder of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail
10 wherein like numerals refer to like elements throughout the several views, one sees that Figure 1 is a cross-sectional view of the compliant brush shower 10 of the present invention. Shower pipe 100 is a cylindrical pipe which feeds water or
15 other liquid to nozzle 102. The water or other liquid is communicated through nozzle 102 to the fabric or similar structure of a papermaking machine or similar apparatus. As is well known, each shower pipe 100 likely has several nozzles 102
20 aligned in at least longitudinal row. Rod 12 rotates along the longitudinal axis of shower pipe 100 as powered by an external drive (not shown). Brush assemblies 14, 16, 18 are affixed relatively equidistantly about rod 12 and extend radially
25 therefrom and rotate in concert therewith. More specifically, brush assemblies 14, 16, 18 have proximal ends 20, 22, 24 which are affixed to rod 12 and distal ends 26, 28, 30 which contact the interior wall of shower pipe 100 and momentarily
30 extend into nozzle 102 as distal ends 26, 28, 30 sweep past nozzle 102 by way of rotation of rod 12. Furthermore, proximal ends 20, 22, 24 of brush assemblies 14, 16, 18 include compliant elements

34, 36, 38 are attached to rod 12 and further are secured to brush holders 40, 42, 44 which, in turn, secure brush bristles 46, 48, 50. Compliant elements 34, 36, 38 add compliance to the radial loading of brush assemblies 14, 16, 18 thereby adding compliance to the contact between brush bristles 46, 48, 50 and the interior of shower pipe 100 while maintaining the stiffness, or at least maintaining the independence of the determination of the stiffness of brush bristles 46, 48, 50. A leaf spring, wave spring, a series of such springs or a foam rubber support can be used as compliant elements 34, 36, 38. The foam rubber support is preferably open-cell rather than closed-cell foam rubber, so as to allow the support to maintain its elasticity when under pressure since closed cell foam rubber would lose its compliance under water pressure.

To use compliant shower brush 10, water or other fluid is supplied to the interior of shower pipe 100 and ejected through nozzles 102. Rod 12 is rotated thereby rotating brush assemblies 14, 16, 18 and brush bristles 46, 48, 50 so that brush bristles 46, 48, 50 contact the inside of shower pipe 100 and further are inserted into nozzles 102 to clean nozzles 102.

Thus the several aforementioned objects and advantages are most effectively attained. Although a single preferred embodiment of the invention has been disclosed and described in detail herein, it should be understood that this invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

What Is Claimed Is:

1. A brush shower comprising:
a central rod;
a brush assembly radially extending from said
central rod, said brush assembly including a
5 proximal end and a distal end, said proximal end
including a compliant element affixed to said
central rod, said compliant element affixed to a
brush holder, and said brush holder affixed to
brush bristles, wherein said brush bristles form
10 said distal end of said brush assembly.
2. The brush shower of Claim 1 further including
a cylindrical pipe with a longitudinal axis, a
cylindrical wall, and at least one nozzle formed in
said cylindrical wall, wherein said central rod is
5 formed along said longitudinal axis, wherein said
distal end of said brush assembly contacts an inner
portion of said cylindrical wall.
3. The brush shower of Claim 2 wherein said brush
bristles momentarily extend through said nozzle
during movement of said central rod in order to
clean the nozzle.
4. The brush shower of Claim 3 wherein said
compliant element includes a spring element.

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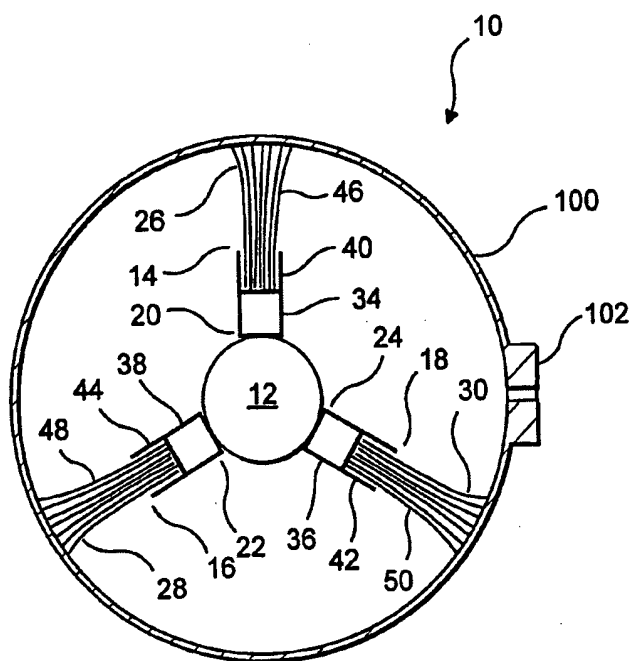


FIG. 1

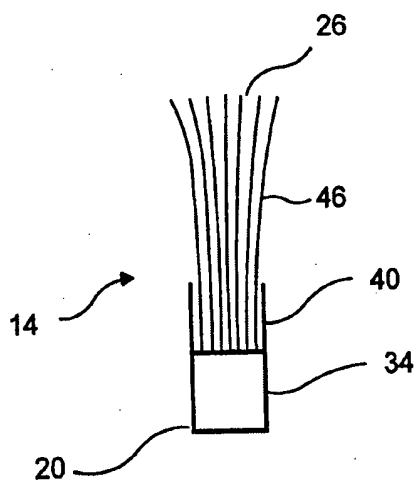


FIG. 2

INTERNATIONAL SEARCH REPORT

Int lonal Application No
PCT/US 00/28383

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 D21F1/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 D21F B08B B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CH 330 841 A (ALFRED REITZ) 30 June 1958 (1958-06-30) the whole document ---	1,2,4
A	DE 27 09 920 A (FRITZ VOGELMANN MODELLBAU METALLGIESSEREI) 14 September 1978 (1978-09-14) the whole document ---	1-3
A	DE 32 17 805 A (METALLGIESSEREI UND ARMATURENFABRIK HEINRICH STAMM) 17 November 1983 (1983-11-17) the whole document ---	1,2
A	DE 809 128 C (HANNS ARLEDTER) the whole document -----	3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
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- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int ional Application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CH 330841	A	30-06-1958	NONE
DE 2709920	A	14-09-1978	NONE
DE 3217805	A	17-11-1983	NONE
DE 809128	C		NONE